Executive Summary for CIF22 Project: End-to-End Mission Design & Trajectory Optimization

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The goal of this project was the integration of NASA's Copernicus and Genesis trajectory design tools to create a new capability for end-to-end mission design and optimization of all flight phases, including Earth ascent, lunar ascent, rendezvous, and lunar descent. This capability is a critical component needed for the next generation of complex human spaceflight design and operations (Orion, HLS, Gateway, Mars) and can serve as a pathfinder for developing a future autonomous, onboard trajectory optimizer. The result was the creation of a new Copernicus/Genesis plugin, which allows a Genesis trajectory (e.g., ascent or descent) to be incorporated into a Copernicus mission, enabling an end-to-end optimization. Inputs from Copernicus are sent to Genesis, which runs and produces output sent back to Copernicus. Thus, the full power of the Genesis tool is available in Copernicus and can be used for a wide variety of applications.